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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re the application of:
EDWARD P. SOCCI, ET AL. Docket: 30-4424

Serial Number: 09/288,589 Group Art Unit: 1733

Filed: April 8, 1999 Examiner: A. Johnstone

#22 8/7/03

For: COMPOSITE COMPRISING ORGANIC FIBERS HAVING A LOW TWIST MULTIPLIER AND IMPROVED COMPRESSIVE MODULUS

BRIEF FOR APPELLANT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is an Appeal to the Board of Patent Appeals and Interferences from the Final Rejection of claims 1-3, 9-11 and 16-22 mailed December 18, 2002 in the above identified case. A Notice of Appeal was filed on June 18, 2003. An oral hearing is not requested.

This Brief is hereby filed in triplicate. The Commissioner is authorized to charge the required appeal brief fee of $320.00 to Deposit Acct. No. 01-1125. In the event that the Commissioner determines that an extension of time is required in order for this submission to be timely, it is requested that this submission include a petition for an extension for the required length of time and the Commissioner is authorized to charge any other fees necessitated by this paper to Deposit Acct. No. 01-1125.

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I. REAL PARTY IN INTEREST

The real party in interest is Honeywell International, Inc.

II. RELATED APPEALS AND INTERFERENCES

With respect to other appeals or interferences that will directly affect, or be directly affected by, or have a bearing on the Board's decision in this appeal, please note that there are no other related applications on appeal or subject to an interference known to appellant, appellant's legal representative or the assignee.

III. STATUS OF CLAIMS

The claims in the application are 1-3 and 5-31. Claims 1-3, 9-11 and 16-22 are pending, stand rejected and are on appeal. Claims 7, 8, 12 and 23-28 have been withdrawn from consideration. Claims 29-31 are allowed. Claims 5, 6 and 13-15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form.

IV. STATUS OF AMENDMENTS

An amendment was filed after final rejection on March 18, 2003. This amendment placed claims 29 and 30 in condition for allowance. The Examiner further concluded that the response did not place the application in condition for allowance.

V. SUMMARY OF THE INVENTION

The present invention claims a fiber-reinforced article comprised of at least two plies wherein each of said plies comprises (a) rubber and (b) cord made from melt-spinnable, non-metallic, multifilament fiber, said cord having

a twist multiplier of less than or equal to about 375,

a stress at 1% strain greater than or equal to about 1.7 grams/denier, and

an initial compressive modulus greater than or equal to about 7 grams/denier, and

said at least two plies having a ply orientation angle of greater than or equal to about 26° with respect to the longitudinal direction of the article.

VI. ISSUES

(a) Whether claims 1-3, 9-11 and 16-22 are unpatentable under 35 U.S.C. 102(b) over British Patent Specification 1,310,316.

VII. GROUPING OF CLAIMS

The application presents three groups of claims that do not stand or fall together:

Claim Group I: Claim 1, for a fiber-reinforced article comprised of at least two plies wherein each of said plies comprises (a) rubber and (b) cord made from melt-spinnable, non-metallic, multifilament fiber, said cord having a twist multiplier of less than or equal to about 375, a stress at 1% strain greater than or equal to about 1.7 grams/denier, and an initial compressive modulus greater than or equal to about 7 grams/denier, and said at least two plies having a ply orientation angle of greater than or equal to about 26° with respect to the longitudinal direction of the article.

Claim Group II: Claims 2, 3, 9 and 16-22 for articles of the invention including additional limitations over claim 1.

Claim Group III: Claims 10-12, for articles of the invention having fiber reinforcement in a third dimension.

Claim Group IV: (allowable) Claims 5-6 for articles of the invention having three plies, wherein two plies have said ply orientation angle of about 30° and the third ply has a ply orientation angle of about 0°; and wherein the third ply has said cord at 4 to 20 ends per inch.

Claim Group V: (allowable) Claims 13-15 for articles of the invention having folds form the edges of the longitudinal direction of the composite; wherein the third dimension is

formed by braiding, and wherein the article has substantially no cut cord ends along its longitudinal edges.

VIII. ARGUMENTS

Claims 1-3, 9-11 and 16-22 stand rejected under 35 U.S.C. 102 over British Patent Specification 1,310,316. It is respectfully submitted that this ground of rejection is incorrect and should be overruled.

The claims are directed to a fiber-reinforced article comprised of at least two plies wherein each of said plies comprises (a) rubber and (b) cord made from melt-spinnable, non-metallic, multifilament fiber. The cord has a twist multiplier of less than or equal to about 375, a stress at 1% strain greater than or equal to about 1.7 grams/denier, and *an initial compressive modulus greater than or equal to about 7 grams/denier*. Further, the at least two plies have a fiber orientation angle of greater than or equal to about 26° with respect to independent claim 1 and the claims dependent therefrom.

Compressive modulus depends on two factors, the twist multiplier and the denier per filament. As a filament gets larger, the ability to bend goes up markedly, usually by a power of three to four of the diameter. Bending makes a great difference in compressive modulus. One cannot make a high denier per filament for solution spun filaments. The materials of this invention are characterized as having a large denier per filament. It has been unexpectedly found that an article meeting all of the parameter conditions of the claims has increased resistance to the various stresses that arise during use of the article.

British Patent Specification 1,310,316 does not mention compressive modulus. Additionally, they do not mention denier per filament. They certainly do not mention or appreciate the importance of the combination of parameters such as a twist multiplier of less than or equal to about 375, a stress at 1% strain greater than or equal to about 1.7

grams/denier, *an initial compressive modulus greater than or equal to about 7 grams/denier,* and the at least two plies having a certain ply orientation angle with respect to the longitudinal direction of the article in order to achieve increased resistance to the various stresses that arise during use of the article.

The Examiner states that Appellants' arguments that the initial compression modulus is not inherently met contradicts the specification. Appellants respectfully assert that the Examiner is incorrect. While Appellants have stated that a PEN cord meeting only the twist multiplier limitation would necessarily meet the initial compressive modulus limitations of the claims, this does not speak of the initial compression modulus being inherently met by the cords of British 1 310 316. This merely states that should the twist multiplier limitation be met, the initial compressive modulus limitation would also be met. The Examiner therefore incorrectly assumes that the twist multiplier limitation is also inherently met.

The problem to be solved in British 1 310 316 is to optimize the wear-resistivity and the cornering power. In physical terms, "it is necessary to minimize the deformation of the tire tread when the tire is run along a curved path. To this end, the breaker layer is required to have a high lateral rigidity..." Regarding British 1 310 316, "one of the essential feature of the present invention is to provide for the best combination of the breaker cord material and the angular position of such breaker cords." The present application takes a similar approach by considering both the preferred cord features and the angular position. However, there is a very significant difference regarding the cord requirements.

British 1 310 316 follows the conventional wisdom (see page 6, lines 5-7) "that the high Young's modulus of radial tire breakers results in more efficient belting effects. The best way to use given fibers having a high Young's modulus is to use them at a low twisting rate." If one followed that teaching, then one would take an aramid yarn (> 600 g/d

modulus) and make a low twist cord. Table 1 of the present application shows that low twist aramid cords have about a two-fold increase in tensile modulus versus similar low twist PEN cords. However, their compression moduli are about a third of that for PEN. Per the discussion on page 22 of the present application, "tire belts made of such cord would likely have poor tread-wear characteristics and poor cornering coefficient, due to the low compression modulus values." This is supported by the discussion in Column 1, lines 28-44 of the cited patent, U.S. 5,246,051. This Bridgestone patent (U.S. 5,246,051) goes to extraordinary measures (impregnating the filament bundle with the resin) to enhance the compression modulus of textile cords. The applicants accomplish a similar result by merely making sure that the individual filament diameter is sufficiently large to generate the cord compression modulus. This is expressed in our claim limitation stating "an initial compression modulus greater than or equal to about 1.7 grams/denier." This limitation is not mentioned *and is not inherent* in British 1 310 316.

Like the present application, the British 1 310 316 (page 3, lines 20-26) focuses on increasing the lateral rigidity of the tire breaker. More specifically, British 1 310 316 takes a 1000d PEN yarn, converts it into a treated cord, incorporates the treated cords into rubber sheets, and then builds tires with belt plies at different cord angles. The same PEN yarn was used for all examples, only the cord construction was varied. There are no teachings regarding the importance of compression modulus nor no data to estimate the compression moduli for the PEN cords used. Since PEN is a melt spun fiber, the fiber size (as measured by denier per filament (dpf)) can be anywhere from the 1-2 dpf range associated with aramid up to the 3-5 range associated with commercial polyester tire yarns. As a result, the PEN cord compression moduli for the '316 patent could be as low as that for aramid. Compression moduli in the presently claimed range are not inherent in the '316 patent and there is no way to determine what they were. For perspective, the PEN used for our patent had "a dpf of about 7" (page 22, line 10).

Note that the resulting tires in British 1 310 316 exhibited optimum cornering power when the cord angles were in the 19-21° range, depending on cord twist and end-count.

These optimums occur at lower angles than the 23° widely used for current commercial tires with steel cord belts and, possibly more importantly, much lower angles than the 26° in the modified claim. It is therefore submitted that the 35 U.S.C.102 rejection is impermissible since the examiner has not demonstrated that British 1 310 316 anticipates the instant claims.

For these reasons it is submitted that this ground of rejection should be rescinded.

British Patent Specification 1,310,316. does not teach or suggest the invention claimed by Appellants. For all the above reasons, claims 1-3, 5, 6, 9-11 and 13-22 are urged to be patentable over the cited references, and the rejections under 35 U.S.C. 102 should be overruled.

Respectfully submitted,

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Date: July 31, 2003

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail, postage pre-paid in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on July 31, 2003.

Richard S. Roberts

IX. APPENDIX

1. A fiber-reinforced article comprised of at least two plies wherein each of said plies comprises (a) rubber and (b) cord made from melt-spinnable, non-metallic, multifilament fiber, said cord having

a twist multiplier of less than or equal to about 375,

a stress at 1% strain greater than or equal to about 1.7 grams/denier, and

an initial compressive modulus greater than or equal to about 7 grams/denier, and

said at least two plies having a ply orientation angle of greater than or equal to about 26° with respect to the longitudinal direction of the article.

2. The article of claim 1 wherein said twist multiplier is less than or equal to about 310.

3. The article of claim 1 wherein said initial compressive modulus is greater than or equal to about 9 grams per denier.

5. (Allowable) The article of claim 1 wherein said at least two plies are three plies, wherein two plies have said ply orientation angle of about 30° and the third ply has a ply orientation angle of about 0°.

6. (Allowable) The article of claim 5 wherein said third ply has said cord at 4 to 20 ends per inch.

9. The article of claim 1 wherein said cord is made from polyethylene naphthalate.

10. The article of claim 1 having fiber reinforcement in a third dimension.

11. The article of claim 10 wherein said third dimension of reinforcement comprises folds.

13. (Allowable) The article of claim 11 wherein said folds form the edges of the longitudinal direction of the composite.

14. (Allowable) The article of claim 11 wherein said third dimension is formed by braiding.

15. (Allowable) The article of claim 1 wherein said article has substantially no cut cord ends along its longitudinal edges.

16. The article of claim 1 wherein said cord further comprises said cord having a denier per filament of greater than or equal to about 2.

17. The article of claim 1 said cord further comprises said cord having an initial tensile modulus of at least about 165 grams per denier.

18. The article of claim 1 wherein said article has an in-plane shear modulus of at least about 730 pounds-force per inch.

19. The article of claim 1 wherein said article has an in-plane shear modulus of at least about 830 pounds-force per inch.

20. The article of claim 1 wherein said article has a fatigue of at least about 2700 cycles to failure.

21. The article of claim 1 wherein said article has a fatigue of at least about 5500 cycles to failure.

22. The article of claim 1 wherein said article is a tire belt.

29. (Allowed) A fiber-reinforced article comprised of at least two plies wherein each of said plies comprises (a) rubber and (b) cord made from melt-spinnable, non-metallic, multifilament fiber, said cord having

a twist multiplier of less than or equal to about 375,

a stress at 1% strain greater than or equal to about 1.7 grams/denier, and

an initial compressive modulus greater than or equal to about 7 grams/denier, and

said at least two plies having a ply orientation angle of greater than or equal to about 23° with respect to the longitudinal direction of the article;

the article further having fiber reinforcement in a third dimension, wherein said third dimension of reinforcement comprises stitches or folds, and wherein when folds are present, said folds form the edges of the longitudinal direction of the composite.

30. (Allowed) A fiber-reinforced article comprised of at least two plies wherein each of said plies comprises (a) rubber and (b) cord made from melt-spinnable, non-metallic, multifilament fiber, said cord having

a twist multiplier of less than or equal to about 375,

a stress at 1% strain greater than or equal to about 1.7 grams/denier, and

an initial compressive modulus greater than or equal to about 7 grams/denier, and

said at least two plies having a ply orientation angle of greater than or equal to about 23° with respect to the longitudinal direction of the article;

the article further having fiber reinforcement in a third dimension, wherein said third dimension of reinforcement comprises braiding.

31. (Allowed) A fiber-reinforced article comprised of at least two plies wherein each of said plies comprises (a) rubber and (b) cord made from melt-spinnable, non-metallic, multifilament fiber, said cord having

a twist multiplier of less than or equal to about 375,

a stress at 1% strain greater than or equal to about 1.7 grams/denier, and

an initial compressive modulus greater than or equal to about 7 grams/denier, and

said at least two plies having a ply orientation angle of greater than or equal to about 23° with respect to the longitudinal direction of the article, and wherein said article has substantially no cut cord ends along its longitudinal edges.